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Preminiraly Results of Electrometric Search on the territory of the Svetitskhoveli complex

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Abstract

On the territory of Svetitskhoveli resistivity was conducted el. profiling different Spacing (AB=3მ; 6მ; 9მ ¤ 18მ). Two of the main was profile of temple spent at in the north, and one – east and Vertical Electrical Sensing (VES) twenty-one point, the maximum AB/2=25მ.

Geoelectric section excreted next horizons: 1. Bulk; 2. Loamy; 3. Riqnari clay composition ; 4. Basic rock -clay shale.

The electric profiles seven archaeological plot anomalies of nature.

In the study area range from height ground-water 4,2-4,2 m.

Applied Geophysics, one of significant fields of Natural Sciences, is often very important for the study of cultural development of our civilization and is used as an effective instrument for verification and reconstruction of the history of culture.

In Archaeology of geophysical methods is that they enable to study a monument before its excavation.

Geophysical data make it possible to conduct geological-archaeological explorations as these data contain information not only about the cultural layer, but about the upper part of the geological section as well. This makes simpler to find links between old buildings and territories of exploration [1,2].

Sveti-Tskhoveli is one of the greatest ecclesiastic buildings survived so far in Georgia. It has been a religious center of Christian Georgia for centuries. In spite of the monastery has undergone many changes – the most part of the frescoes has disappeared, and whitening of the walls has resulted in the lack of other organic elements necessary for its artistic integration, it makes a great impression even in our days [3].

Sveti-Tskhoveli Monastery, as one of oldest buildings, keeps many secrets in itself. Georgian catholicos-patriachs, kings and people have always been reconstructing and taking care of it.

It is well known that the monastery of Sveti-Tskhoveli is situated on the territory of the "Royal Garden". Since the oldest times the monastery has kept many Christian sacred things, but we are aware of the location of just some part of them. It also keeps the graves of many Georgian kings and patriots that are to be studied and verified by Georgian people. It is supposed that there must be the remains of King Mirian's palace in the yard of the monastery [4].

The Geophysical investigations have been conducted in two directions:

1. Study of hydro-geological particularity of the territory around the monastery;
2. Search of unknown (hidden) archaeological monuments on the territory of the monastery and around it.

We used two modifications of electric resistance – electrical profiling and Vertical Electrical Sounding (VES). The placement of the profiles and the points VES are shown in the scheme (Chart. 1).

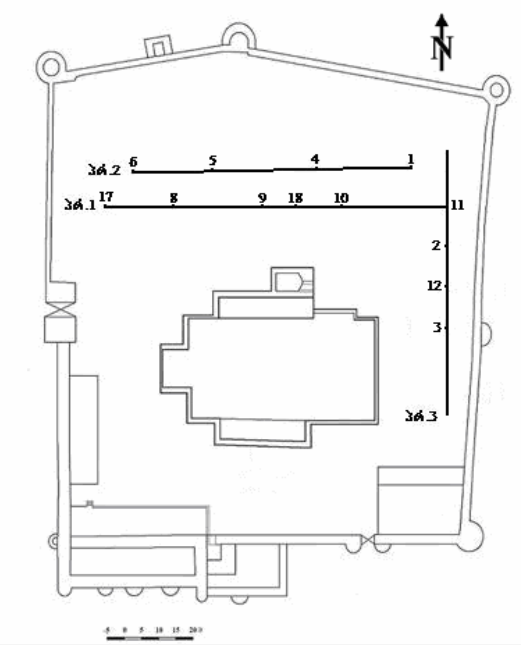

Chart.1. Electrical profiles and vez - specific deployment scheme

On the territory of Sveti-Tskhoveli the profiling was made by resistance method with four spans (AB=3m; 6m; 9m and 18m) that enabled the current distribution and the study of the geological section in the depth of 3-4 m and 1,5m step. Vertical Electrical Sounding was conducted with a maximal span of AB/2=25m that makes possible to describe the geological environment till 8-10 m depth.

Two main profiles were made in the North of the monastery, and one – in its East. We also conducted VES in the northern, eastern and southern parts. (Fig.1)

Fig1. Electrical profiles

We studied the sections of the above mentioned profiles till 12 m depth and distinguished four main horizons.

Profile 1

The capacity of the first horizon along the profile fluctuates between 0,5-0,9 m and is characterized by 50-140 ohm resistance (Chart 2).

In the first horizon (layer) along the profile in approximately 35 m the resistance is 40-60 ohm, in the 40 meters during it is 90-110 ohm, and to the east at the end of the profile it rises up to 140 ohm.

In 9-11 m along the profile the capacity of the horizon varies, and the resistance fluctuates between 12-30 ohm.

Along 40 m from the beginning of the profile the resistance equal to the first layer in the depth is approximately 7 m capacity. In the №10 VES area the layer with 25-30 ohm resistance approaches the day surface. To the East, at the end of the profile the resistance fluctuates again between 12-18 ohm. After 8-11 m from the depth the resistance becomes less than 8 ohm.

From the archaeological viewpoint the interesting areas are: I area – in the 22-58 m line and II are – in the 78-83 m line.

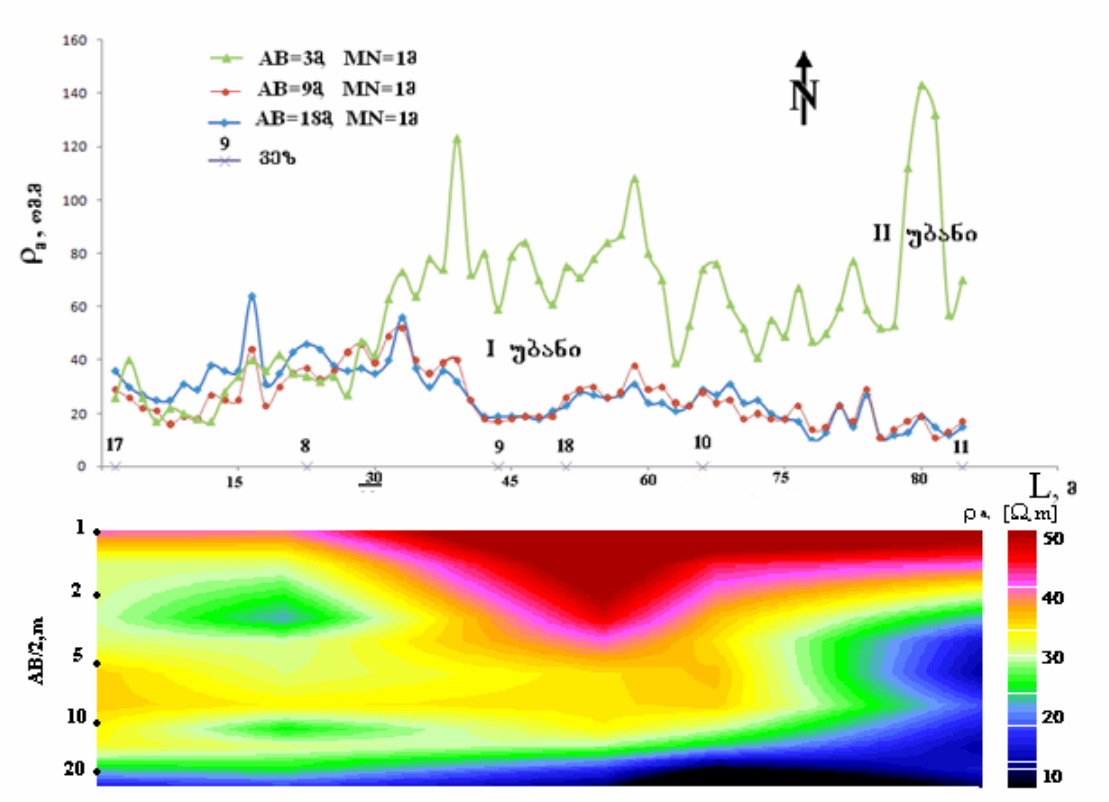

Chart 2. Distribution of phantom electrical resistance Pr .1 - he along.

Profile 2 is situated in the 10 m North from the profile 1 (Chart 3). In this profile the resistance distribution is analogical in depth to the one in the profile 1 with three distinguished layers: the resistance of the first layer fluctuates between 20-90 ohm, and the capacity is 0,4-0,8 m. The capacity of the second layer varies between 8-12 m.

At the beginning of the profile, by the data of the №6 VES, the first layer is continued in nearly 2,5 m by a layer with less resistance that slightly increases in the depth. Along the profile it approaches the surface approximately in 20 m, and in the depth it extends to 12 m. At the end of the profile the resistance decreases.

The third layer also decreases here and is less than 8 ohm.

We distinguished two interesting areas in the archaeological viewpoint in the second profile: III area – from the beginning till 12 m of the profile, and IV area – from 36 m to 42 m.

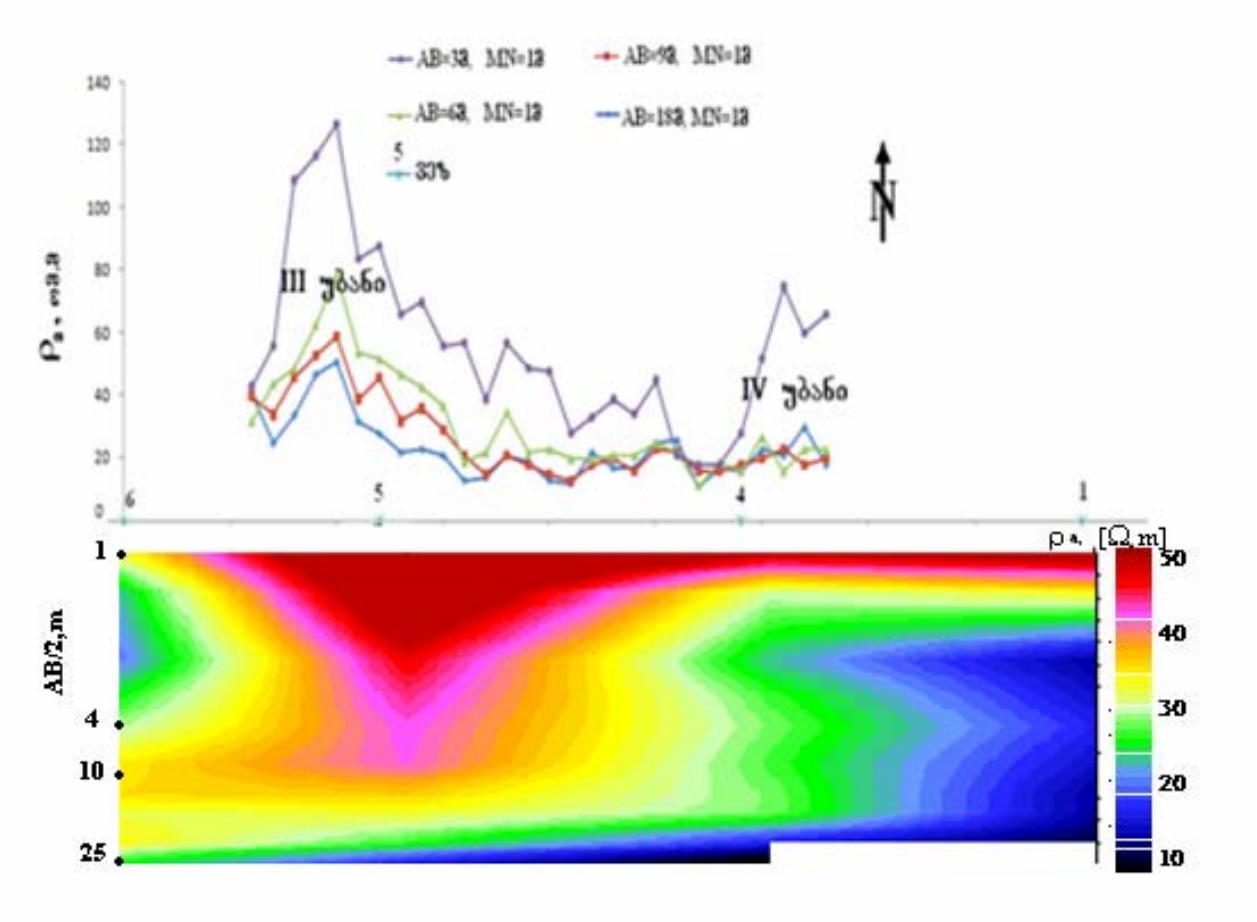

Chart 3. Distribution of phantom electrical resistance Pr .2 - he along.

In the **profile 3** the capacity of the first horizon fluctuates between 0,6-1,0 m and is characterized by 40-120 ohm, at some places – by 150-200 ohm resistance (Chart 4).

The areas with their resistance values up to 50 ohm correspond to dump layer, that is presented by clay and gravel fragments. The areas with increased resistance as 70 ohm and more must also correspond to dump layer with building materials and ruins of buildings.

In all geo-electrical segments the third geo-electrical horizon is obviously distinguished and widely spread. As a matter of fact its resistance is of first unit ohm order. Such a value of resistance must correspond to sediments on the terrace of the river Mtkvari, in particular – clay and cobble soil with ground water observed in it.

The third geo-electrical horizon is situated in 5-9 m depth from the horizon. If its little resistance values are caused by ground waters, then any sharp changes of the surface of this horizon in the limits of the profile is quite doubtable. This is also corroborated by existence of ground water surface in 4-4,5 m depth in the prospect holes cut in the monastery corners.

There are three archaeologically interesting areas along the profile 3: V area covering 0-15 m, VI area – in 26-30 m, and VII area – from 58 m to 72 m.

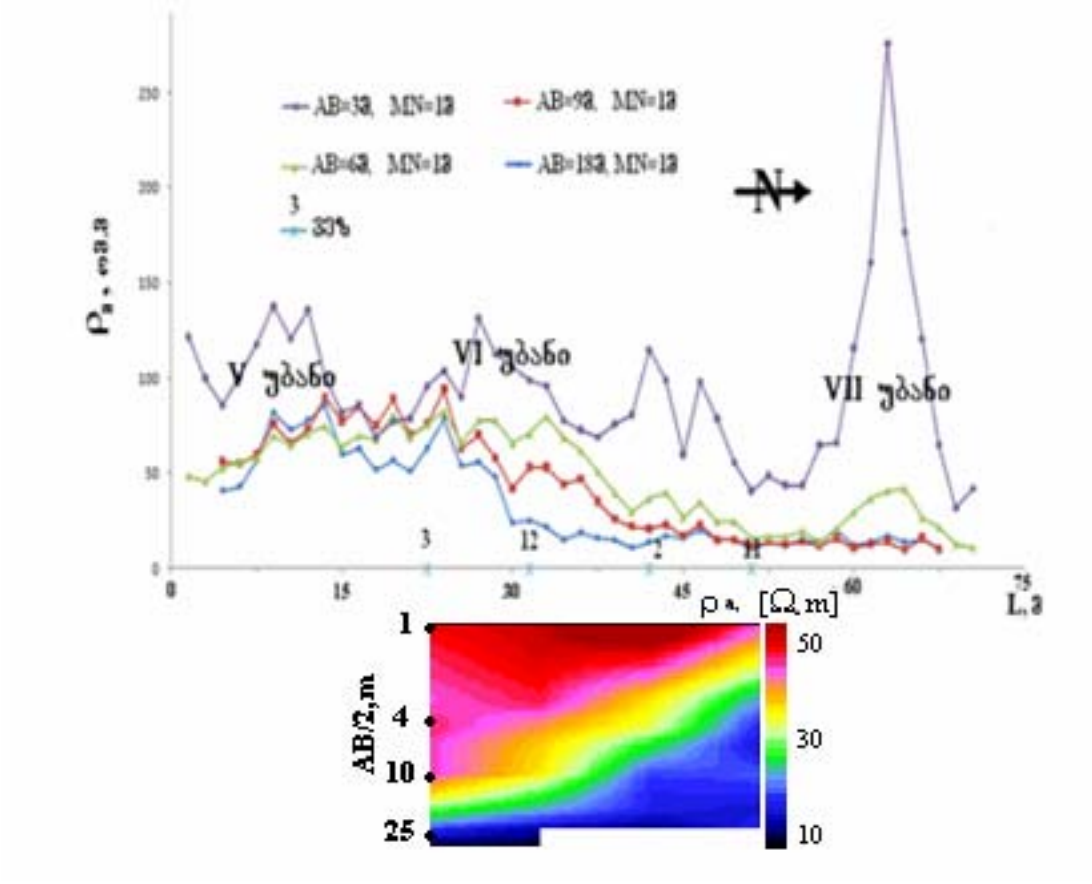

Chart 4. Distribution of phantom electrical resistance Pr .3 - he along.

The second geo-electrical horizon prevents attractions too. Here abrupt changes of resistance values take place in the horizontal direction. The horizon capacity along the profile is mainly 5-8 m, in some areas – 10-11 m. The zones with little resistance that are widely spread and characterized mainly by 12-18 ohm must correspond to clay or river sediments containing clay. Increased resistance of 30-40 ohm values are distinguished in separate areas of the first and second profiles, and 90 ohm is observed in the third profile to the East of the monastery. Taking into consideration the geological data on prospect holes cut in the monastery corners and the boreholes on the territory the zones with increased resistance must have originated due to cobble soil- round stone containing sand and clay.

On the basis of the data of the conducted Vertical Electrical Sounding on the territory we revealed the following situation in the constructed geo-electrical sections: the first layer is represented by dump with the resistance of 50-120 ohm, and its capacity varies between 1,2-2,9 m. Under it an environment with little resistance (2-10 ohm) is observed that is represented by argillaceous soil and its capacity varies as 0,5-3,2 m. The resistance of the third layer changes between 40-180 ohm. It is represented by cobbles and round stone of small size. Its capacity is 1,0-2,5 m. The section in its depth is continued by the main layer – argillaceous slates. The level of the ground water here varies between 4,2-4,5 m (Chart 5).

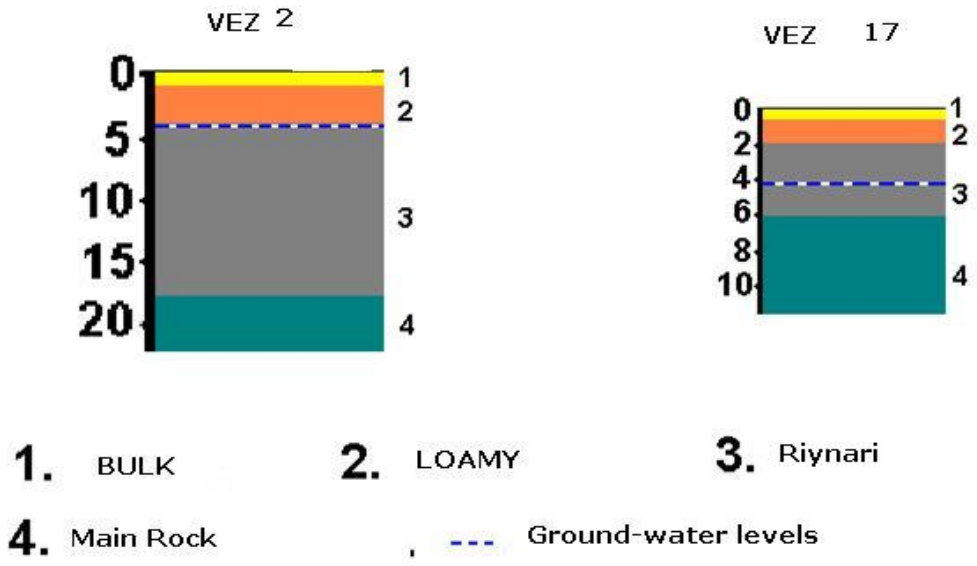

Chart.5

Conclusion:

The profiling works showed, that in all the geo-electrical sections there is a distinguished and widely distributed Riynari, this area contains ground water.

Some separate areas of the first and second profiles have great values of resistance. The third profile in the East of the monastery is especially distinguished by high resistance.

Capacity of individual layers of the sharp variation of the horizontal in the river sediments is quite reasonable. But it is also acceptable that the zones with high resistance might have originated due to ruins of the building or the fence. Thus, they might be interesting in archaeological viewpoint.

It is quite obvious that further detailed investigations with small size parametric prospect holes will make clear many above mentioned issues.

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Предварительные результаты поиска Электрометрические на территории комплекса Светицховели

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Резюме

На территории Светисховели методом сопротивлении было проведено эл.профилирование разными разносами и ВЭЗ в дватеть одном точке, максимальный AB/2=25м.

Геоэлектрическом разрезе выделаются следущие горизонты: 1. насипь; 2. глинозем; 3.галичник с глинозем; 4. глинистые сланцы-основные породы.

На эл. профилях выделаются семь участок аномалии археологической природы.

На изучаемой территории уровен груновой воды 4,2-4,4м.

ელექტრომეტრული კვლევის წინასწარი შედეგები სვეტიცხოვლის ტაძრის ტერიტორიაზე

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რეზიუმე

სვეტიცხოვლის ტაძრის ტერიტორიაზე წინააღმდეგობის მეთოდით განხორციელებულ იქნა ელ. პროფილირება ოთხი გაშლით (AB=3მ; 6მ; 9მ და 18მ). გატარებული იქნა ორი მაგისტრალური პროფილი ტაძრის ჩრდილოეთით, ერთი კი – აღმოსავლეთით და ვერტიკალური ელექტრული ზონდირება (ვეზ) ოცდაერთ წერტილში, მაქსიმალური AB/2=25მ.

გეოელექტრულ ჭრილებში მკაფიოდ გამოიყოფა შემდეგი ჰორიზონტები: 1. ნაყარი; 2. თიხნარი; 3.რიყნარი თიხნარის შემავსებლით; 4. ძირითადი ქანი–თიხა ფიქლებრივი.

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ტერიტორიაზე გრუნტის წყლის დონე მერყეობს 4,2–4,4 მ–ის ფარგლებში.